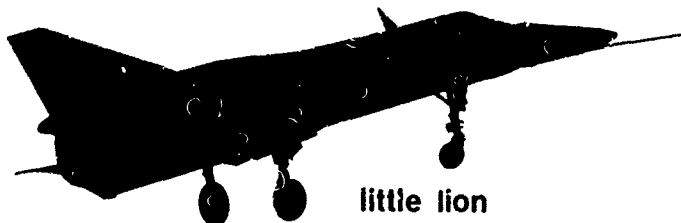


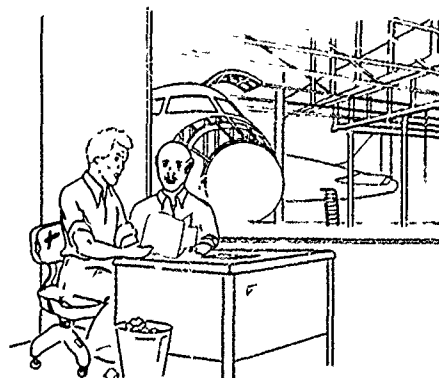
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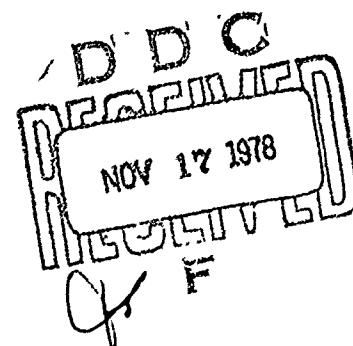


CANOPY OVER ISRAEL

Eyewitness reports on the selection, training, and assignment of personnel in the Israel Air Force

Norman H. Gray
1 September 1978

A study for the Chief of Naval Operations
(NAVAL AVIATION AND TRAINING — OP59)
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ACKNOWLEDGMENTS

The foresight and effort of RADM C. S. Williams, Jr., Director of Naval Aviation and Training (OP 59), made this effort possible. His keen interest in the improvement of U.S. Naval pilot selection and training has been manifested in his every effort. His visit to the IAF confirmed his belief that much could be learned from the IAF.

The author is indebted to COL Y. Shavitt, Air Attache, Israeli Embassy, Washington, DC, and the Israeli Air Force through every echelon for its cooperation during two visits to Israel. Also to BRIGGEN Uri Talmor whose official and personal interest in the author's last visit opened many doors. Also to LTCOL Jerry Berlin who at the time of the author's last visit was completing a five year tour as Head of IAF Training R&D. A noted psychologist/behavioral scientist in his own right, Berlin was a medium of much supportive information. Trip reports of LCOL H. M. Whitfield, USMC, and subsequent discussions with him, complemented by the trip report of LCDR E. E. Christensen, USN, were excellent pieces of reporting and provided new and/or supportive data and an additional perspective of the same scenario, all essential to an objective report. Finally acknowledgment is made to the Israeli people and in particular some 97 who also were "interviewed" while in their homes, at work or relaxation. These included lawyers, teachers, bus drivers, doormen, kibbutz people, policemen, guards, and established business people — all of whom had served/serve in some capacity in the Israeli Defense Forces.

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	-- Assignment.	Military reserves									
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) <p>This report presents insights into the Israel Air Force acquired by the Author, augmented by trip reports of other U.S. Naval Personnel who also visited the IAF in 1977-1978. The report presents in succinct and specific terms the IAF selection, training, and assignment procedures and techniques and explains through data presented the high success factor of the IAF.</p> <p style="text-align: right;">S/C 393 & C1</p>											

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PREFACE

In "Trusting Ourselves" (American Heritage, June/July 1978), the eminent historian Bruce Catton points to faith in people as the only firm basis for solutions to the problems confronting the contemporary world.

His thesis is supported by the example of the Israeli in forging out of severely limited manpower and other resources an air arm whose effectiveness would do credit to a nation 10 times the size of theirs.

The Israeli keep this miracle alive by accepting responsibility for it. Without regard for personal convenience, every young Israeli male aspires to be a pilot in the IAF. If not a pilot, then a navigator or technician.

The author has questioned Israeli of all sectors – military, civilian, and religious – as to the reason for this universal total acceptance of a military obligation. The answer is always the same:

"Our secret weapon is that we have only ourselves."

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INTRODUCTION

The state of Israel and its air force seem out of scale with each other. Population is less than 3.5 million. Territorial expanse is roughly comparable to that of New Jersey. Resources are limited. Yet the Israeli Air Force (IAF) is among the world's largest and most modern.

The disparity reflects unusual accomplishment for the means available. Clearly the Israeli are using what they do have in a most effective manner.

The US Navy – in particular, the Chief of Naval Operations (CNO), through the Director of Aviation Training and Manpower Division (OP 59) – has for some time been engaged in observing and analyzing Israeli methods. Specifically, on what criteria does the IAF select its pilots, air crews, and technicians? How does it train and assign them?

The author, a personnel/military and human factors specialist with the Personnel Training and Analysis Office, NAVSEACENPAC, San Diego, visited units of the IAF in Israel in 1977 and 1978 as part of this CNO program. This document presents the results of his observations, of discussions with IAF and US military personnel, and of research in the documentation of the IAF-Arab confrontation. It provides background information on the Israeli state, its people, and its geography. It consolidates previous fragmented reports to provide an overall view of the IAF and its personnel selection, training, and assignment practices in the light of these cultural and environmental factors.

The Israeli experience is heartening. It teaches us what can be accomplished with limited resources but unlimited enthusiasm. . . "and a little luck." It may be applicable to manpower-related problems faced by the US Navy.

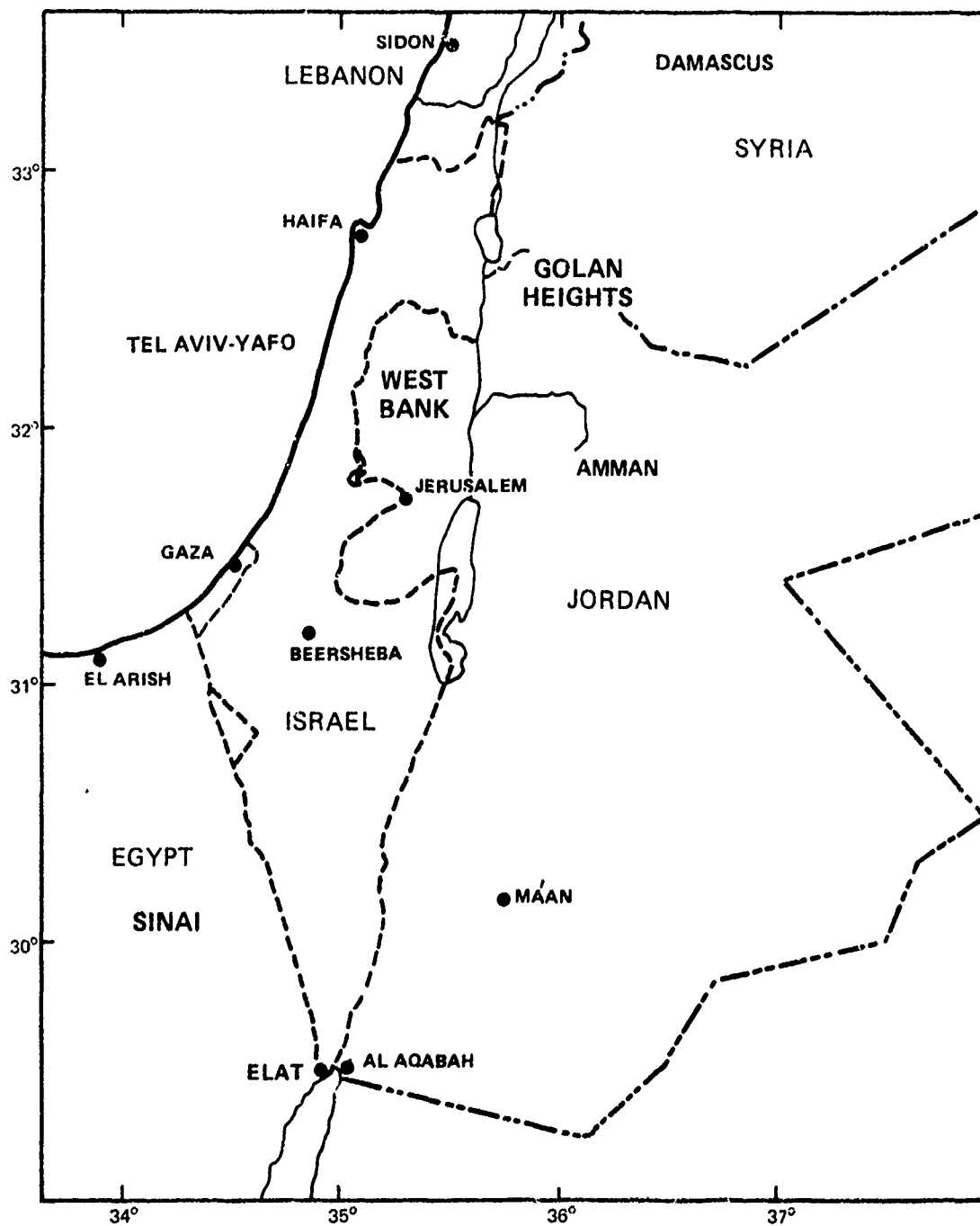
THE IAF AND THE NATION

ISRAEL

Israel is a land of contrast in topography, people, mode of living, and religion.

Located on the Asian continent, close to Africa and Europe, it touches three seas (the Mediterranean, the Red Sea, and the Dead Sea), and is bordered by four Arab states (Lebanon, Syria, Jordan, and Egypt). Within a framework no greater in area than New Jersey it displays respectable mountains and the lowest point on earth (the Dead Sea), arid deserts and a flourishing agriculture, a sleepy pastoral culture and hypertensive modern cities.

Israel currently occupies the Sinai desert and the Gaza Strip (formerly held by Egypt), Judea and Samaria (the West Bank – formerly held by Jordan), and the Golan Heights (formerly controlled in part by Syria). The accompanying map shows the State of Israel with these contested areas.



THE PEOPLE

The Jewish population of Israel is composed of Ashkenazim, Sefaradim, and Orientals. The Ashkenazim come from central and eastern Europe, mainly Germany ("Ashkenaz" in Hebrew) and its neighboring countries, or are descendants of Ashkenazim who had emigrated earlier to America, South Africa, and other lands. The Sefaradim are descendants of the Jews from Spain ("Sefarad"). The Ma'aravim are related to the Sefaradim and originated from North Africa – Morocco, Algeria, and Tunisia, which are to the west ("Ma'arav" in Hebrew) of Palestine. The Oriental communities originate from various Moslem and Arabic speaking countries. The Yemenites come from Yemen, a Moslem state in Arabia. The Iraqis come from Iraq, ancient Babylon. Iraq is one of the Moslem states which invaded Palestine during the Israeli War of Liberation. The Kurds come from Kurdistan in Northern Iraq. The Persians are from Persia, today Iran. Other Oriental groupings are the Afghan, from Afghanistan, also a Moslem state; the Bucharans from Bucharra, today part of Soviet Russia; and the Cochins, immigrants from the province of Cochin in southern India.

PRESSURE FOR PROGRESS

The threat which Israel faces is real, and there are constant reminders that it is not imaginary. Alert launches occur daily, and pilots especially are constantly reminded of the closeness of the threat. Because of the recent '67 and '73 wars, much organizational inertia is absent. The entire Air Force maintains flexibility and is constantly adjusting to what it perceives the threat to be. Its success is due to recognition that it cannot afford to become mired in past successes.

Discussions with BRIGGEN Talmor, of the Manpower Division, centered around attitudes which remain constant in this environment of incessant change.

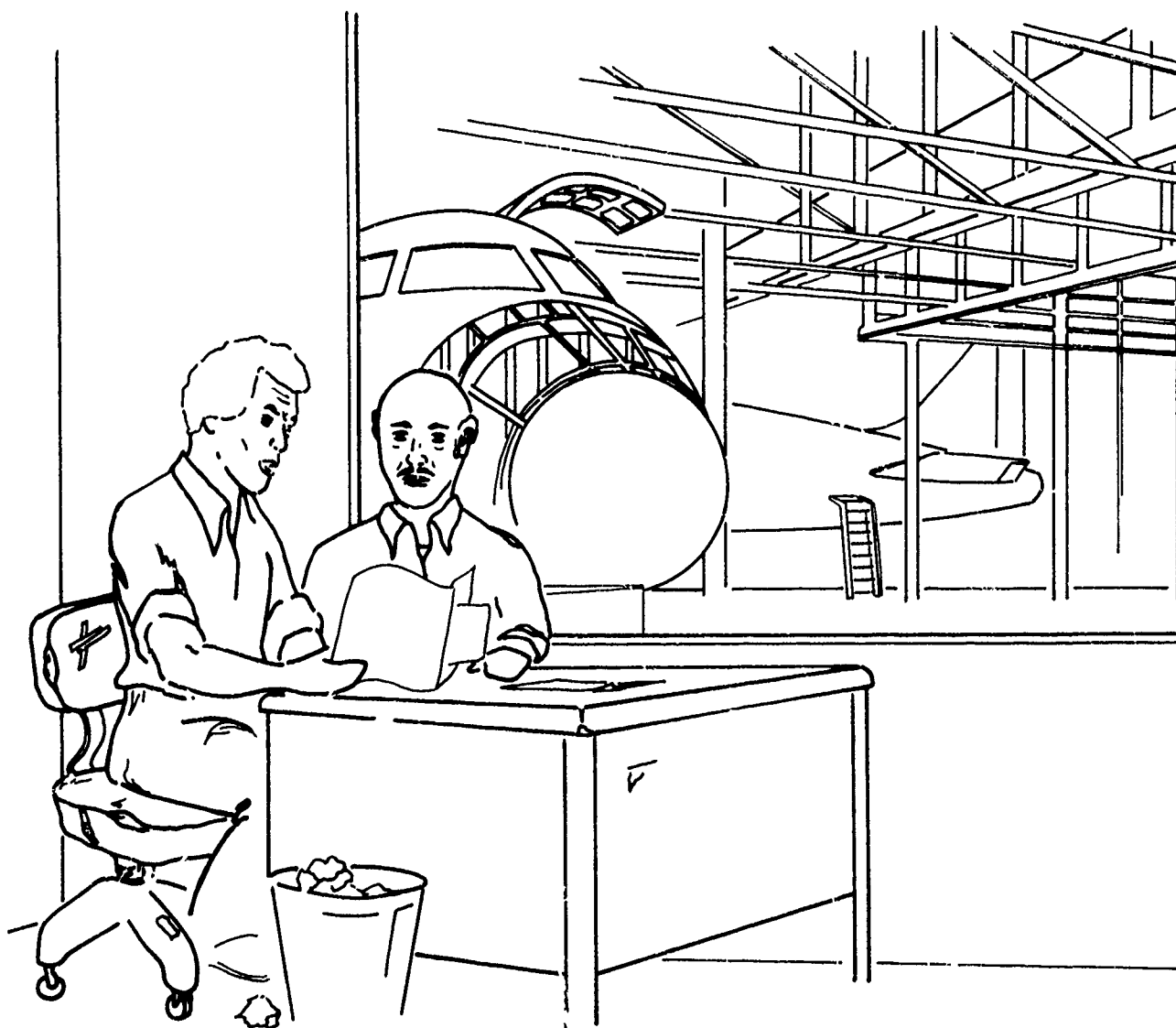
There remains the determination that the IAF must be the best there is. It must be kept young, and its officers must be ever receptive to new ideas. Officers enter flight school at age 18 with a tenth grade education but efforts are continuously made for them to attend universities to broaden their perspective.

The uniform is worn with pride and respected by the general population. IAF personnel and civilians alike consider their Air Force to be the best in the world. Yet they are – first, last, and always – probing for new and better ways to do things. Ideas are welcome from any quarter.

EQUIPMENT

In 1948 the infant IAF inherited, from the British Royal Air Force (RAF), hangars, fields, planes, RAF trained personnel, and an RAF operational mode; then the French and the Mirage aircraft* became a major influence. In recent years the U.S. has become the

*The IAF was the first to operationally fly the Mirage aircraft. The French developed it, but the French Air Force had not tried, tested, and debugged it at the time the Israeli put it into the air.



Israel Aircraft Industries Ltd (IAI) has annual sales of \$400 million, about half of it from exports, currently has export orders for \$350 million worth of GABRIEL missile systems. "Senior executives work in crumpled slacks and open-necked shirts. The chief financial officer sits in a patched chair that he won't spend money to replace." *FORTUNE*, March 13, 1978

primary influence in design, hardware, and training, now greatly augmented by Israeli self-capability. Throughout this transition, during which they were engaged in four wars, the Israeli have maintained a very high level of operational readiness through their own resourcefulness. One perceptive comment that has stuck with the author is "There is a limit to smartness. The rest is money, resources, environment, and luck."

The equipment (aircraft, weapons, etc.) is predominately American, although great reliance is still placed upon the Mirage 3/5 fighter and the Israeli version of this, the Kfir ("Young Lion"). The personnel (administration, squadron) and flight procedures organization reflects a mix between the U.S. Air Force and Navy, possessing the essence of the Navy Command structure with some organizational/flight discipline principles of the Air Force. The weapons/ weapon systems, like the aircraft, are primarily American; however, great confidence is placed in the home-grown SHAFRIR missile and the 30-millimeter cannon.

All Israeli aircraft which can be retrofitted to 30-mm cannon have been. These aircraft include A-4, Mirage, and Kfir. All Israeli pilots talked to stated that the 20-mm gun was relatively ineffective against threat aircraft. The majority of air-to-air gun kills were achieved by 30-mm cannon. One hit can mean a kill, three will guarantee it.

All A-4's are outfitted with tailpipe extensions which mask the aircraft IR signature, providing protection against surface-to-air missile attack. Extenders can easily be replaced on damage or loss.

INDUSTRIAL COMPLEX RELATIONSHIPS

A close relationship exists between the Government of Israel and the industrial complex. The Israel Ministry of Defense, in fact, is the Armament Development Authority.

This close relationship enables the military to readily assess its needs and to mutually define specifications for new weapon or support systems with such firms as Israel Aircraft Industry (IAI).

IAI, comparatively speaking, is young. Here was designed and built the Kfir-C2 aircraft, an Israeli derivative of the French Mirage III/V aircraft. Being young, this industry often offsets its relative lack of design experience by more efficiently evaluating a wider range of design alternatives through computer-assisted design (CAD) techniques.

One of the advantages of Israeli Defense Industries is that they are not bogged down by historic inertia involving methodology — the relatively young designers and engineers are prone to accept the use of modern computer-aided technology. The government and the Israel Labor organization have established a department for the efficiency of production. There is now (1978) a requirement for a productivity council wherever there are 50 or more employees.

There are many examples of the quick responsiveness to military need provided by the close relationship of Israeli Defense Ministry and Israeli industrial complex. The examples presented reflect only a small sample of the state of Israeli technology even though its total production is only 2% or so of that of the United States. The important factor is that their production probably represents a large effort in relation to their size and resources. It is indicative of productivity, quality control, and the increased interest of the young in technical training.

Elbit was created in the 1960's as Israeli's first digital computer company. The Ministry of Defense supplied the initial nucleus of computer specialists, who had been previously employed in defense laboratories. "Elbit" is derived from the Hebrew "bi'ahawn" meaning security, and thus Elbit implies electronic security. Elbit has developed an improved, smaller PWRS-1 (programmable weapons release system) that incorporates a micro-processor that can be reprogrammed quickly to accommodate new air-to-surface weapons or tactics. The two units that comprise the PWRS-1 weigh 7 pounds.

The system with some built-in test provisions is designed to detect approximately 50% of potential malfunctions. More complete built-in tests can be provided if desired.

Head-up displays (HUDS) and the gunsight camera used by the IAF are probably completely products of the Israel-Electrical Optical Industry, Ltd. (EL-OP).

Kfir aircraft now use much larger projection optics providing the pilot with much wider field of view, ± 10 deg., thus enabling greater head movement freedom as well as more information displayed. EL-OP's extremely small gunsight cameras designed with a small periscope installable on either a gunsight or HUD have improved air-to-air combat and air-to-ground strikers. The use of the gunsight camera is also extensive in pilot training and debriefing.

Beta Engineering Company in Beersheba has developed portable field units for calibrating and checking engine control systems. The operator need perform no calibrations to correct measurements for normal day flying conditions with this unit.

Rafael Industries developed and produces the SHAFRIR air-to-air infrared guided missile. The GABRIEL missile is produced by Israeli Military Industries, a government-owned research development and production complex. (GABRIEL destroyed 13 Arab ships in 1973.)

Whether by design or accident, Israeli industries tend to specialize in specific areas, thus minimizing competition for Defense Ministry funding.

Despite the strength of their own industry, there is usually a need by the IAF for hardware/avionics, etc., in real time. Accordingly, the IAF looks first and intently at available, or what we call "off-the-shelf," equipment. This may in turn be modified by their skilled technicians/engineers to meet their specific needs.

It is when there is nothing available abroad that the Ministry of Defense funds local development.

A case in point has been their particular need for range-only radar for Mirage aircraft. Israeli pilots needed radar with a look-down capability and the capability to lock-on at very low altitudes amidst clutter. This need was met by development of a compact, solid state range-only radar with a mean time between failures of 150 hours.

In most cases, modular development is such that there is fast flight-line replacement.

It must not go unnoticed, however, that in many cases United States companies either own shares in Israeli industry or license the Israeli to build many components. For supporting information on this subject the reader is referred to articles in Aviation Week, April 10, 17, and 24, 1978.

TECHNION

Another cornerstone of Israel's technological development and its development of engineers for its military forces is the Israel Institute of Technology, commonly referred to as Technion. It is often referred to as a cross between the American Massachusetts Institute of Technology (MIT) and the United States Bureau of Standards. Here a large percentage of Israeli officers (IAF) receive their aeronautical mechanical and/or metallurgical education, after having been in the IAF for some time.

The institution is run with military organization precision. During its early development and growth, GEN Yaakov Dori, first Chief of Staff of the Israeli Army, was its head. At present Amos Horev is President, having been a Major General in the Defense Forces and Chief Scientist of the Defense Ministry.

An example of its growing influence in the past decade is the fact that, even though Technion is now over 50 years old, 70% of all advanced degrees awarded have been awarded since 1968. While the number of electrical engineering students at Technion is increasing modestly every year, the number of aeronautical engineering students leveled off during the early 1970's, to pick up again after the 1973 war. Since 1958, when Technion graduated its first aeronautical engineering class, it has awarded 837 bachelor of science degrees, 101 masters degrees and 23 Ph.D.'s.

Over the years Technion has been the recipient of large donations, particularly from the United States. In 1957 Gerald Swope of General Electric fame left \$7,000,000. Buildings such as Electrical Engineering Aeronautics Laboratory, the Albert Einstein Institute of Physics, and the Hydraulics Building have been gifts of individuals or U.S. groups. Britain, Canada, South Africa, and Singapore are representative of other countries which have made significant contributions to Technion.

THE MANPOWER POOL

Twenty-two thousand teenage Israeli each year turn 18 and enter the manpower pool which must provide the input to all defense force units.

The defense forces consist of the Army, the Navy, the Air Force, the Corps of Parachutists, and the Submarine Flotilla. The regular army, comprised chiefly of officers and top noncommissioned officers, is the core of the defense forces. The rest of the Army consists entirely of conscriptees. Reserves and frontier settlements are other elements of the defense system.

Every male Israeli is obliged to serve 3 years and every female Israeli 2 years — or 4 years if deferred to complete post-high-school education. Each is then recalled to active duty for 3 or 4 weeks each year until the age of 55.

Many Israeli engineers and industry officials when recalled for active duty each year find themselves using or maintaining equipment they have themselves designed and produced. One Israeli engineer observed: "My two sons, one in the Army and the other in the Air Force, inform me very quickly when they detect a deficiency in the radio sets I helped to design, and they don't hesitate to suggest ways in which they could be improved." This close involvement of the two communities serves to motivate production workers in the factory.

Israeli defense forces determine manpower policies in unison with the policy of the government. Manpower control is computerized through the national defense system, from which Army, Navy, and Air Force receive their quotas of personnel, depending on priority.

THE marginally QUALIFIED

The induction center for a number of years was located in a section of Tel Aviv called Tel Hashomer – the Hill of the Watchman. The name is fitting, because although the center rests on flat ground, in all reality it is the eye that watches over manpower policies in keeping with Israel's need to strengthen its national security no less than its defense.

The Israeli believe that there is a national role for all to play – except the near-idiot class, those emotionally disturbed beyond salvage, and those in need of prolonged medical attention – and that all Israeli should accordingly serve time in the military. The standards of the defense forces do not appear to have suffered. Through the years, the overall rejection rate at Tel Hashomer for all causes, of which physical disability has been the largest, has been about 10% of their 18-year-old males.

This is in contrast with U.S. experience in WWII, during which 29% of the total number examined were rejected. In some years prior to total commitment in Vietnam, the rejection rate in the U.S. rose to 50%.

Some Israeli officers do say that their policy of accepting slow learners and low-IQ types imposes a heavy and frustrating burden on training. In contrast, the psychiatrists at Tel Hashomer say, "We take into account IQ because it is an interesting factor. Our data show no significant relationship between IQ and job performance under arms when classification is sensibly conducted." There is a follow-up evaluation of the low-IQ soldier after he has been in service a year or so. After this period, he is considered to have overcome his initial fright and to have picked up the rhythm of his assignment. At this time, his supervisors are asked to evaluate him on job performance.

Statistics show that the Israeli soldier who would be discarded by the U.S. for low IQ is rated equal in nine out of ten cases to the general standard of the army by his commander. It is further said, surprisingly, that the highest average of good performance by the low IQ's occurs in the technical services, and the lowest in the infantry.

No Israeli youth is rejected because life denied him a chance to attend school. No education requirement exists for induction or for officership, although compulsory education through grade nine now exists throughout Israel.

One objective of accepting low IQ's and the undereducated has been to put firm foundations under people who might lack them. In the service, they are taught Hebrew, made literate, shown how to work with others. They learn new skills or a trade. They return to civil life as more useful citizens.

THE GIFTED

The military system also does the testing for those who seek deferment for educational purposes. Only one criterion exists: mental and emotional superiority. Magnetism, imagination, and "aura" are required, the thinking being that the subject may have potential

for leadership in fields other than military such as statecraft or science. Unless the applicant is qualified for leadership by IQ, personality, bearing, etc., there is no deferment. The decision is up to the experts at the Hill of the Watchman, who have the priority lists that indicate the nation's leadership needs.

THE RESERVE

SERVING ON TWO FRONTS

With Israel's small size — 7800 square miles — and enemies poised in view on her borders instead of across wide seas, mobilization must be effective immediately, and citizen soldiers must be able to sight through tank periscopes at opponents within hours of being called. Moreover, the omnipresent threat is so large and the population so small that Israel could not afford a standing army large enough to defend it against sudden attack. The response has to be by a trained citizenry, men and women who can spend the rest of the time at tasks productive in the national economy.

Oddly, mobilization arrangements are patterned in part on a 3000-year-old battle plan of King Solomon. King Solomon's old fortress at Megiddo was regarded as an archeological curiosity because while it included storage space for food and wine for 5000 men and assembly space for 300 war chariots, the stables were built for only 30 horses. Research revealed that the fort had a peacetime garrison of only about 100 men. If war threatened, 30 would saddle up the few horses in the standing army and charge around the countryside to rally the farmers, summoning them to service in the fort, where combat equipment was kept ready.

So it is with Israeli defense forces today. The regular army has only four 4000-man brigades, one of them paratroopers, plus a separate armored command of division size. But the reserve has another 24 brigades, one-third armored. It adds up to 60,000 regulars and about 204,000 reservists.

Again, however, military experts do not class the Israeli reservists with those of the Arab countries or even those of the United States. Combat readiness and mobilization potential are such that for practical purposes the entire force, regular and reserve, is credited to the battle potential of Israel the moment war breaks out, not after a 30-day or a 60-day mobilization period.

Almost everyone serves. Wartime mobilization puts 10% of the population in uniform, a feat matched by few if any other nations. The percentage has been higher — 25% in 1948 during the first Arab war, when Israel had a much smaller population.

As reservists are mobilized, so are city buses. Israeli soldiers ride to battle in the very buses they might otherwise be riding to their office jobs. A reservist who in civilian life drives a tractor with a piggy-back trailer can expect on mobilization to drive the same vehicle — this time carrying a tank at high speed to the front line, where it rolls off the trailer still fully fueled.

All private aircraft are mobilized into the Air Force, private boats into the Navy, and heavy mechanical equipment such as cranes, generators, and power winches into the Corps of Engineers. In the 1956 Sinai campaign, ice cream trucks from Tel Aviv, plastered with mud for camouflage, carried rations to desert troops. It also happened in 1967.

UTILIZATION AND RETRAINING

The Israeli Security Service Act of 1959 spells out in succinct terms the periods of service for all eligible personnel.

In peacetime, periods of service are 36 months for males age 18-21 and 24 months for females.

After this regular service, reserve service is mandatory until age 39 for males and 34 for females.

For the above age group, there is an annual call-up obligation of 31-38 days per year. Males age 40-54 have a call-up obligation of 14-21 days. Females have no reserve obligation beyond age 34. In addition to the above call-up obligations, all categories of reserve personnel are subject to 1-3 days of qualified call-up monthly. Naturally, there are certain categories of exemptions such as medical, marriage (females), religious, and personal.

As an example of determining readiness, a commander is authorized to call up his personnel at night to "check the system" and such a call-up would not be included in his totals of allowable monthly or annual call-ups.

An example of the service a 22-year-old reservist will expect to perform in peacetime is illustrated below.

CALENDAR YEAR

JAN - No call-up

FEB - No call-up - might be a 1-night call-up - not counting

MAR - No call-up

APR - Call-up 3 days

MAY - None

JUN - None

JUL - None

AUG - Three days

SEP - None

OCT - None

NOV - One night

DEC - 31 days

PROFILE
IDF Period of Service
(Peace Time)

<u>Age</u>	<u>Male</u>	<u>Female</u>	<u>Duration</u>	<u>Service</u>	<u>Exemptions</u>
18-21	X		36 months	regular	medical
18-20		X	24 months	regular	medical, marriage
21-39	X		31-38 days	reserve	medical, personal
40-54	X		14-21 days	reserve	medical, personal
20-34		X	31-38 days	reserve	pregnancy/personal
<u>All</u>	X	X	1-3 days monthly	reserve	

(To be sure, despite the logical and functional pattern of reservist call-up designs, some senior officers indicate "flaws" within the Air Force aspects of the reserve system. There is a feeling that "arrangements" have developed between the IAF and Headquarters and the IAF and the reservists. These may exist because of conflicts between aviation regulations, budgets, time, and other rules which have to be bent to make the most of the reserve call-up system.)

Morale is very high within the squadrons and within the IAF reserve air crews. The close friendships and respect between and among individual peers and loyalty to the squadron probably account for nearly 100% of IAF pilots having voluntarily agreed to be called up at any time.

Pilots, no matter what their civilian role may be, are often inquiring as to when they can fly. This is an example of their intense desire to maintain a high degree of skill. For the reservist, the flying requirement is 30 hours every month, but many pilots do much more. In wartime, a regular squadron can react almost immediately, and could carry on without reserves for 48 hours. However, most reserve pilots are on duty within 2 hours of an emergency call-up.

Reserve pilots maintain the same level of proficiency as active duty pilots in both day and night flying.

When a squadron changes the type of airplane it flies, special training courses are required for not only the reservist but also the regular pilot. This is usually solved by the reservist's volunteering for active duty. Drawing his pilot's salary, the reservist is actually a regular for the duration of the necessary training.

If a reserve pilot cannot convert to the new plane along with his squadron, he can be assigned to another squadron with the plane at which he is proficient. If this is not compatible, he may be assigned to staff, or accept a liaison role with a ground unit's Reserve Maintenance personnel. Reserve maintenance personnel who do not work in their trade for 6 months, either in the military or as a civilian, automatically lose their accreditation -- and must be rechecked to regain it. This is another example of the professionalism of the system. Thus far, technicians in all likelihood face two call-ups a year of 15 days each rather than the one long call-up of 30 days.

Reports from the IAF indicate this is very satisfactory.

There is a basic guidance and policy with respect to all training. As indicated elsewhere in this report, the Basic Maintenance officer is responsible for maintaining the proficiency status of all technicians, regular or reserve, assigned to a base. With this type of responsibility and accountability, each base maintains a *very* high aircraft full system capability.

The system of retooling the technician during the two 15-day call-ups is quite simple and is as follows:

The first 2 or 3 days are spent in refresher training with the technicians. The technician then joins the working groups in intermediate level, and is finally integrated into the regular workforce. Modifications on new aircraft are done by reservists. This familiarizes them with the new aircraft and at the same time prevents an overloading of the regular technicians. In fact, more often than not, regulars look up to the reservists as more knowledgeable and experienced. The key to this operation is that each man is a member of a team, and the Israeli Air Force is a team game.

The electronic field poses more problems to the training of reservists who are not similarly employed in the private sector.

Reports of the numbers and types of reservists and how they are utilized within the IAF vary. However, the following breakdown is probably as reliable as any other — the point being that three basic integrities are maintained: the integrity of the Nation's defense; the integrity of the Air Force; and the integrity of the pilot trained at great sacrifice to a nation's economy and to the individual's personal life, both of which are considered secondary to the nation's security.

UTILIZATION OF RESERVISTS*

<u>Types</u>	<u>Percentage</u>
Technicians	50%
A-4 pilots	50%
Phantom pilots	25%
Helicopter pilots	50%
Air defense units	98%-100%
Flight crews and aerospace rescue	90%
F-15**	5%
E2-C	All regular

*For pilots in general, and for pilots used in spotter planes, etc., there is apparently no policy — and no figures emerged from the studies or observations contained herein.

**On new aircraft, planning always considers a very small percentage of reservists. However, the very competency of the Israeli pilot (reservist and regular) and the operational mode of squadrons indicate an early proficiency in new aircraft by reserve pilots. This is the basis of IAF strength.

THE PILOT

THE ULTIMATE AMBITION

To be a pilot in the IAF is the ultimate ambition for most young male Israeli.

The Israeli fighter pilot is a very dedicated and aggressive professional. He is disciplined in flight and informal in military courtesy. He belongs to a well organized service which is in the throes of transition from a small and informal organization to a larger and more rigidly structured one.

The IAF has first priority on all people eligible for military service and accepts all those who are qualified and motivated. The stature of the IAF fighter pilot is high in the eyes of the Israeli people. The pilots view their role as one of complete commitment. Quotas are not set for maximum numbers to be trained. The IAF stresses quality over quantity in pilot training efforts. The training mission is to produce a fighter pilot who is tops in intercept, air combat maneuvering, and air to ground flying skills. The goal is always a maximum yield of quality fighter pilots. There are no plans to lower standards to attain the numbers of pilots required despite demands placed upon the training command to meet the needs of an expanding air force. Cost is not a deterring factor.

SELECTION

A major reason for a discussion of Israel, the State, the Israeli culture, and political-social dynamics is to impress upon the reader the impact of Israeli environment on military programs. The selection, training, and assignment of pilots and maintenance technicians must be appraised in that context. This is not to say, however, that techniques and procedures should be overlooked or downgraded.

Competence is almost the password in the Israeli Air Force, if not in the Defense Forces altogether.

Because of universal military service, would-be pilots can be very carefully chosen, even from a small total population base. Conversations with IAF personnel and figures mentioned by IAF officers have led to acceptance of the fact that of any group of 300-500 applicants perhaps one to five will actually become pilots.

The first phase of screening of Israeli young men starts at age 17. Those who have indicated a desire to enter the IAF, and who are mentally fit and have had 10 years of schooling, subject themselves to two psychological tests.

The Otis Verbal Measurement IQ test and nonverbal embedded figure tests such as the Raver Matrices are given. An interesting factor is that candidates need only to be of average intelligence to move forward in the screening process. This is important to note!

This has taken place when the boys are still 17, probably in their last year of high school or its equivalent in a kibbutz. Those who survive, and these are considered the lucky ones among their peers, are again critically tested as soon as they are inducted into the IDF at age 18. Here they will be given, in all probability:

- Mechanical comprehension tests
- A mechanical assembly test
- A time and accuracy eye/hand coordination test

Most candidates survive this phase of the selection process. Now the Aviation Research Medicine people enter the selection process and through a series (perhaps three) of psychological paper and pencil measuring tools try to ferret out such key elements in each applicant's life as home, health, involvement in Israeli youth groups, likes and dislikes, avocations, people they relate to or do not relate to, and other factors such as critical incidents in their lives to date.

Following this, the cadets take a series of as many as five types of tests (personality). These include:

- The Matric Perception tests specifically designed to reflect aviation bias
- Draw-a-man tests
- Sentence completion tests
- Taylor Manifest Anxiety test

The author was advised that the use of Rorschach tests was ended in 1975-1976.

The above tests completed, the Aviation Medicine clinical psychologists then work them up for review by a senior or a psychiatrist.

At this point, the cadet is interviewed by the senior official and is given a rating. This is based as follows:

Candidate's personality	40%
Perceptual/motor tests	30%
Background variables	30%

It should be now clear to the reader that a very thorough and scientific preselection process has been ongoing, all prior to actual selection and screening. It is, however, an example of the effort the IAF goes through – leaving nothing to chance – in assuring that the best are selected.

At the 10-day selection and screening camp (exactly that) a new group of behavioral scientists and pilot/instructors supervises a very rigorous environmental survival program.

Constantly observed by the groups of scientists and pilots, each cadet is soon given a new rating based on his (1) motivation, (2) officer training tests, and (3) sociometric "pilot" and friend tests.

It is in this 10-day period that up to 50% of this carefully selected group of perhaps 500 candidates wash out.

A most interesting fact emerges: these selection procedures cull out all but the best potential candidates very, very early in the game. Although costly in the initial phases, this precludes spending a large share of limited resources on the actual training of pilots who would then fall out at the end of the 20-month period. Or, worse yet, would not be the top-combat-effectiveness pilots necessary to an air force.

The official 10-day selection process is grueling. The applicants previously screened as potentials are now administered additional psychological tests on the ground, and, just as meaningful, they all are personally observed and studied by psychologists and instructor pilots.

The cadets are now grouped and assigned to one or more leaders who are instructors and/or psychologists. They are given extensive physical problems in which their wit, stamina,

fortitude, and ingenuity are taxed in solving a problem (akin to survival or escape) in a limited time with only the tools at hand.

Just as they are throughout the Defense Forces, leadership qualities, whatever they are, are sought in every cadet. Is he flexible? How well can he improvise? Every cadet is measured by these criteria.

TRAINING

As indicated above, potential candidates are thoroughly screened and tested. Only the top 50% survive.

The IAF flying school is located at Hatzerim AFB near Beersheba along with some operational F-4 and A-4 squadrons. The curriculum at the school has not changed to any degree since the 1973 war, but the incentive has changed with a need for more and better pilots - conflicting objectives. During the 4-month selection phase, the student flies 10 piper cub sorties, approximately 7.5 hours flight time. Reserve pilots serve as the instructors for this phase of flying, which tests basic motor skills. Cadets are shown only such basic maneuvers as coordinated turns and holding a heading and altitude. They do not perform takeoffs or landings. After nine flights with two different instructors, plus a check ride, 40% of the survivors of the 10-day screening have been rejected. This period also includes, as part of a basic training program, basic studies in mathematics, physics, aircraft mechanics, meteorology, and navigation.

There is 10% attrition of students during the follow-on 4-month preparatory phase of flight training. This soldiering phase includes 2 more months of studies. The infantry and field training takes place in a rugged camp environment.

The preparatory phase permits the selection of prospective helicopter pilots and navigators for the primary phase of flight training from those who do not qualify to continue in the fighter pilot pipeline. During the 4-month primary training, the student solos in the French-made Fouga Magister training aircraft after 10 hours of flight instruction. The student flies 60 dual and 30 solo sorties which include all-weather navigation and high-level instrument training. There is a heavy 40% attrition of students during the primary phase.

There is only 7% attrition during the following phase, a 4-month basic flight training program in which the prospective fighter pilot now flies 56 dual and 30 solo sorties in the Fouga Magister. In addition to all-weather navigation, instruments, low-level navigation, and night flight training, the student continues with studies, as he has in all previous stages. Sorties in primary and basic are 45 minutes in duration. Some of the students who do not meet the high standards set for prospective fighter pilots during the basic phase are assigned to helicopter training and navigator training. Others go as officer candidates to the armored force or the paratroops, the other elite branches of the Israeli Defense Forces.

The IAF has been evaluating an innovation which consists of 4 months of academic studies following completion of the basic flight training phase. There are no flights during this phase, in which the student studies technology and the natural sciences at Ben Gurion University at Beersheba near the Central Flying School at Hatzerim Air Base. There is no attrition during this phase.

Upon completion of this period of academic studies, despite the 4-month period of no flying, the student evidently does not have any difficulty strapping himself into the TA-4 for the first time as he commences the 4-month advanced phase of the flight training

FIGHTER PILOT TRAINING PIPELINE

SCREENING	10 DAYS		50% WASHOUT
SELECTION (GROUND SCHOOL)	4 MONTHS	10 PIPER CUB SORTIES TURNS HOLDING HEADING, ALTITUDE	40% WASHOUT*
PREPARATORY	4 MONTHS	SOLDIERING	10% WASHOUT
PRIMARY (FOUGA MAGISTER)	4 MONTHS	60 DUAL, 30 SOLO SORTIES ALL-WEATHER NAVIGATION INSTRUMENT TRAINING	40% WASHOUT
BASIC (FOUGA)	4 MONTHS	86 SORTIES ALL-WEATHER NAVIGATION INSTRUMENT TRAINING LOW-LEVEL NAVIGATION NIGHT FLYING	7% WASHOUT
ACADEMIC	4 MONTHS	NO FLYING	NO WASHOUT
ADVANCED	4 MONTHS	A-4'S AND MORE SOPHISTI- CATED AIRCRAFT	3% WASHOUT
OPERATIONAL TRAINING UNIT	4-MONTH PHASES	CONTINUED TRAINING	

*OF SURVIVORS

program. The IAF has four A-4 simulators and one F-4 simulator. The attrition during this phase is quite low — 3%.

Upon receiving his wings at the completion of the advanced flight training phase, the student has been in the program for 2 years and has accumulated about 220 hours of flight time. He must then obligate himself to 8 years of service from the date of receiving his wings.

Some student pilots who wash out during the advanced phase of the fighter syllabus undergo training in light aircraft and then receive their wings. Helicopter pilots and navigators also complete their training and receive their wings after a total of 2 years of training.

The fighter pilot enters the postgraduate phases of his training after receiving his wings. The new pilot reports to an A-4 Skyhawk squadron which functions as an Operational Training Unit (OTU) in addition to being continuously ready for combat. The IAF stresses the ability to cope with the unexpected on all missions. The first 4-month phase in the OTU includes 70 hours of flying time covering air-to-air combat, air-to-ground, formation, and night flying. Flying on target ranges is also included. The OTU is the counterpart to the U.S. Navy's Fleet Replacement Squadron (FRS).

The new pilot transitions into an operational fighter pilot. The 200 hours of flying time are directed toward air-to-air and air-to-ground combat, night and day target range exercises, operational exercises, and special courses in formation leadership and weapons systems. Although the OTU syllabus is somewhat similar to that of the U.S. Navy's FRS, the IAF pilot is not considered to be proficient upon completion of the OTU. Although he is considered to be an operational fighter pilot, he would not be used in a combat situation except under worst-case conditions. He must complete three of the 4-month training cycles or 1 more year of training before he is considered to be a proficient fighter pilot and available for assignment to an intercept squadron. A-4 squadrons fly 60% air combat and 40% air-to-ground. The format for each squadron's training efforts is based upon continual repetition of these 4-month training cycles. Reserves and nonsquadron active duty pilots must fit themselves into these standardized training cycles.

The Israeli never seem to waver from a basic philosophy of assuring that the nation's investment of money in training their manpower is not wasted on assignments not in keeping with their training. Every pilot is a pilot first, last, and always. He is not a maintenance officer nor is he a supply officer.

The base commander (COL) is a flyer, is considered to be "the best," and maintains that capability. It is the same way with wing and squadron leaders. When pilots are assigned to headquarters for duty, they must, and do, maintain their combat flying capability by returning to their squadron at its base twice a week.

PROMOTION

Ben-GURION Talmor said "We never promise, as you do, what your next job will be." Instead we tell you that your next assignment may be one of three or four, dependent on your *proficiency* and *events*.

Promotion comes as a result of proficiency and excellence, not because of career assignment requirements. By carefully assessing their flying requirements and being assured of an adequate qualified input of pilots on a continual basis to meet their "flying slots," the Israelis have no need to find other assignments for dedicated pilots.

Within this climate, the air force officer really plans his career within the IAF after the age of 24. At this time, he has proved his proficiency and has fulfilled his initial obligation to the IAF. He has been trained as a combat pilot and has flown continually for approximately 5 years in one flying assignment or another.

At this age he may leave or, better, agree to remain. If so, his pattern of assignments, further education, and expectations will be carefully and specifically worked out with him. No carrots are extended in the way of unfulfillable commitments.

If the pilot decides, at age 24, to remain in until he is 30, another 6 years, there are conditions under which he can leave the air force if he so desires within that tour. However, contrary to U.S. Navy experience, probably fewer than 3-5% of their fliers resign.

At age 30 another decision is at hand. The pilot now makes a definite commitment to "out" or remain in for another 10 years to age 40. He will seldom leave during this era because of his pension benefits at 40.

Throughout service as officers in the IAF, two-thirds of them will have specific technical and/or engineering assignments with several short-term training periods in something specific, maintaining a balance between work (duty) and training.

The fighter pilots are the elite. Their peer equivalents in the Army would be Tank Commanders. The average age of pilots in a fighter squadron is 25; a squadron commander is 30, and a wing commander 37. The Commander of the Air Force is but 44.

When they reach their rank as Major, they are provided housing and half the cost of a car — no insignificant item in the Israeli economy. As a LCOL, housing, a car, gasoline, and utilities are the rewards.

AIR OPERATIONS

The sharp contrast between headquarters facilities (austere) and base and squadron activities (thoroughly equipped) serves to underline the great importance placed upon the actual weapon systems and the personnel who operate and maintain them.

At a forward base, a normal day is 8-9 hours.

All pilots in a squadron fly the same type of hop each day. A pilot must have about 450-500 flight hours prior to assignment to an interceptor squadron. They are highly selective not only as to who is eventually assigned to their F-4, Mirage, and KFIR squadrons, but also as to who then is considered skilled enough to fly all missions, particularly that of intercept. The pilots go through what is called a 4-month conversion syllabus when first reporting to an F-4, KFIR, or Mirage squadron. There is no OTU for this transition. The conversion training is spread around various squadrons so that no one squadron is continually involved with the conversion program. It normally takes place once a year per squadron.

Squadron routine calls for continuous training evolutions. Briefings on weather, intelligence, and so forth commence at about 0730. Then the squadron flies from 0830 to 1330. The flights are followed by debriefs, ground training, and then briefings for the next day's training flights. The day normally ends about 1800. They fly 5 days per week and conduct ground school on the sixth day. Afternoons are devoted to aircraft maintenance. The pilots in all squadrons that are not in the OTU program fly the same schedule each day as laid out in the 4-month training cycle. Pilots average 35-40 sorties per month and 14-20 hours per month. The commanding officer of these squadrons has authority to modify the content of these 4-month training cycles to meet his squadron's readiness needs. Air Combat Maneuvering (ACM) is high on training priorities. ACM flights last about 25 minutes; air-to-ground about 1 hour. 80% of training is dedicated to dog fighting — 20% to air-to-ground. The training consists of extensive use of gun cameras for postflight assessment. They spend 16-20 months in KFIR/F-4 squadron and fly about 300 hours.

All pilots and navigators are required to serve as instructors and must attend the 4-month instructor's course. The course includes 1 week of the theory of teaching taught by a civilian professor from a local university, 1 week of technical education on aircraft theory and how to relate same as an instructor, and 1 week with an army infantry division to learn leadership techniques and basics of command. Ground school includes subjects such as the art of flying, visits to defense industries, and visits to Army tank forces. The prospective instructor must fly 40 sorties before he is qualified to instruct and progress through all phases of instruction. Out-of-control flight does not receive special training emphasis, since pilots who fly ACM flights are quite experienced through a program of gradual introduction on how to fly the edges of the departure envelope. The Israeli Air Force considers Air Combat Maneuvering proficiency to be the true test of their pilots' airmanship. As instructors, they must return and fly with their operational squadrons once a week -- and for 1 week every 4 months.

The Israelis liken their operating environment to that of U.S. Navy air operations -- small numbers of aircraft in remote areas and significant authority vested in the pilots.

The IAF practices with fair regularity "strategic" missions/weapons delivery and has IP's all over Israel which update their low level strategic target navigation. They have all targets within 500 miles designated and IP's at the outer limits of the Israeli-held territory. IP markers in Golan Heights mark the exact position/heading to Damascus Airport.

"Low level" tactics in close/direct roles are being reviewed. The Israelis suffered severe losses to the Syrians/Egyptians during the '73 Yom Kippur War. They went in low against the Syrians in the Golan Heights below the ridge lines and were hammered by ZSU-23's and SA-6's.

The IAF emphasizes the use and assessment of gun camera films. Aircraft tracking is considered vitally important. Nine flights are required in the A-4 OTU on the "art" of gun camera tracking composed of:

1. 4 flights constant range tracking
(2 bogey constant altitude, 2 bogey maneuvering)
2. 5 flights position tracking
(3 bogey tailchase/2 bogey constant altitude)

From this point on, tracking is emphasized in the A-4 syllabus until the last flight that a fighter pilot flies.

Assessment of air-to-air work in the IAF is critical. From the first tracking hops in the OTU until the last flight that a pilot makes as a senior base commander, he is subjected to a daily routine of assessing gun camera footage with all members of his squadron present. His camera footage is viewed and critiqued by the squadron with whom he flies. There are no exemptions from this.

The care of aircraft canopies is almost a discipline. All pilot/crew helmets contain chamois coverings. All aircraft brought in for maintenance are covered with a soft cloth to ensure that no unusual bumps or scrapes occur during maintenance. This solves the problems of flying with scarred canopies and buffing out canopies which become too scarred. Obviously, the parallax problem which occurs with our canopies is absent. This almost exaggerated care bestowed on a portion of the aircraft epitomizes the determination of the Israeli to have everything going for them.

For aircraft with linear C_L curves, the Israelis mount a C_L max indexed from 0 to 1.0 which gives the pilot the ability to determine how closely to the maximum performance of the aircraft he is flying.

As an emergency procedure checklist, a metal box is located in each aircraft tabbed with the numbers of emergency procedures. When a tab is pressed, an emergency procedure pops out which is easily readable from the pilot's position in the cockpit and can be easily restored to the stowed position.

The Israelis place great emphasis on air-to-air and firmly believe that the man who can fight air-to-air well can do anything else well. It is as important to the role of an A-4 pilot to fly ACM as for any interceptor pilot to fly ACM.

There has been a change in emphasis in the philosophy that the IAF goes about fighting other aircraft. They spoke of 100 1V1 similar flights before the first dissimilar or multiplane hop. In today's IAF they fly 20 1V1 similar, then 4 2V1, then 22-25 2V2 similar.

IAF has all of the most up-to-date training aids of the services -- video tape replay/cameras, view graphs, etc.

Safety of aircraft is of vital concern to any air force. The Israeli Air Force is particularly tough on this subject. In discussions with their pilots and ranking officers, conversation often centered around "Safety vs Edge of the Envelope" and the problems of accidents involving aircraft spins. The Israeli indicated their last "spin" loss was sometime in 1976. They spend a lot of time at the upper-left side of the envelope and are proficient in it. They handle negligence or deliberate disregard for "safety of flight" severely. It was told, without any humor, that flathatting has been known to earn a week in prison for the offender.

All squadrons are standardized; all squadrons hold APM's each day and require crews to know emergency procedures/flight procedures by rote.

The IAF now has plans for continuing education for their pilots. This educational program will obligate those who undertake the education to further service.

Jealousy is not part of the *modus operandi*. There is a functional role for every man and woman in the service and each seems to recognize the need of the other. Upon completion of daily flight operations (usually 0830-1330), pilots bring their planes in to their station position and turn over their maintenance requirements to the maintenance supervisor. The planes must be ready at 0600 the following day for operation, and 90% or more of them are.

FITNESS

ALCOHOL AND DRUGS

The question was raised with a number of people regarding problems with alcohol and drugs. It is almost with disdain that they retort "we have no problem here!" It is not part of the culture.

MEDICAL EXAMINATIONS

It was often repeated that the same military fitness requirements that exist for admission are maintained throughout the duration of the pilot's tour of duty within the IAF. "We can afford nothing else" was the justification. (In the Israeli state population, however, considerable attention is now being given to "stress," because of high incidence of heart problems at about age 40.)

THE SOCIAL SCIENTIST

On some bases there is a position filled by a social scientist or experimental sociologist who reports to the Base Commander. The job has never been satisfactorily defined, but the function is to provide the Base Commander with another form of information.

The subject is sensitive. It appears that, although the program continues, it is weakened by some built-in traps.

The social scientist is likely to present the Base Commander a list of problems. The Base Commander is likely to be more interested in solutions.

Also, the social scientist is liable to overstep his area of competence out of a desire to provide "psychological assistance" to troubled people. Pathological problems are the province of the M.D. with psychiatric training.

THE MAINTENANCE TECHNICIAN

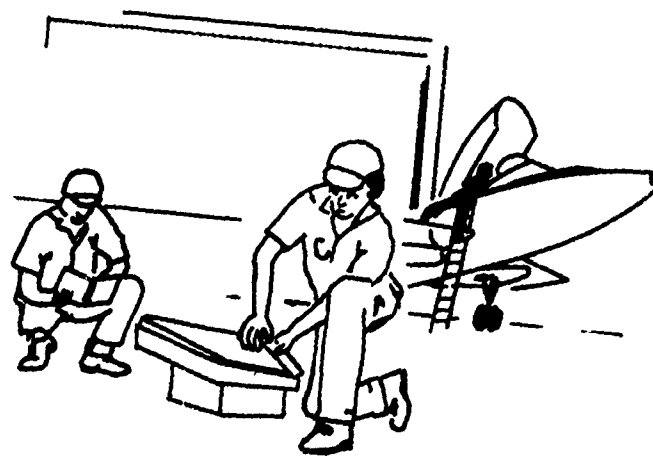
The selection, training, and assignment of maintenance personnel in the IAF is as careful and deliberate as the selection, training, and assignment of pilots.

SELECTION

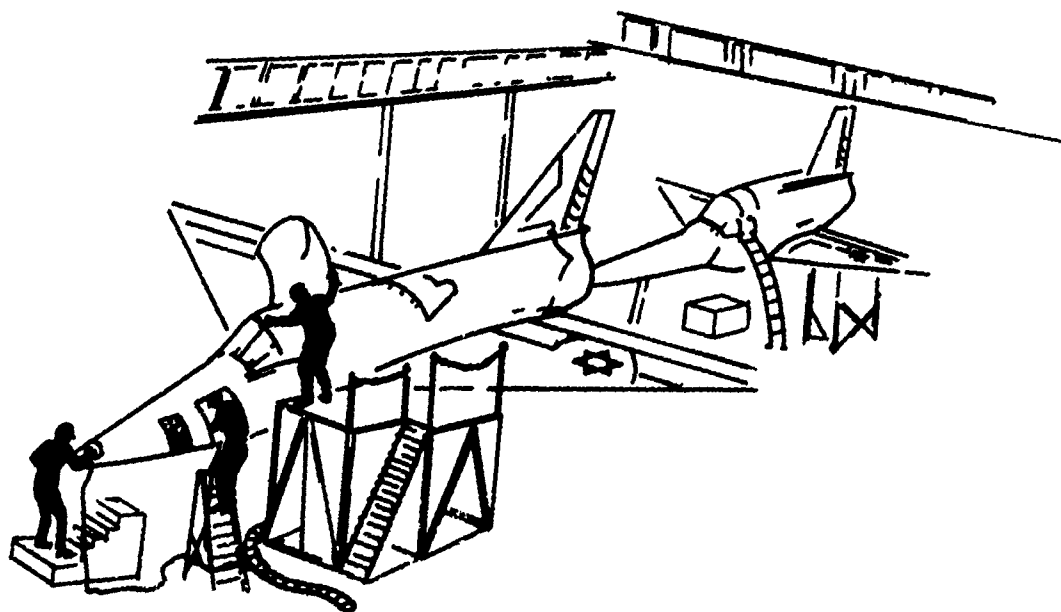
Nine years of compulsory education exists throughout Israel for all. At least by age 17, or somewhere in the eighth year, the Israeli are screened through national tests which reveal to authorities the potential availability of manpower.* The test scores indicate emotional stability, skills, job potential, and leadership aptitudes. At this time, the 8th or 9th grader may decide he wants technical training. He may be encouraged to enter subsidized technical training or he may enter a civilian trade/technical school at his own expense.

As an example, he may enter Haifa Air Force Technical School for a 2-3-year program. During this time, he is a civilian cadet and does not "belong" to the military. Upon completion, he is committed to his 3-year obligatory service plus a 2-3-year period for his training. The whole purpose here is to extend the "real life" of this technician's service to the task at hand — maintaining aircraft and related duties.

*Includes male and female. Also potential for pilot selection revealed here, and for all the defense forces.



AIR FORCE-DEVELOPED SKILLS



OFTEN TRANSFERABLE TO INDUSTRY

Israel Aircraft Industries Ltd (IAI) is a major source of training for airplane mechanics. IAI provides a quantitative/qualitative journeyman program beginning at age 14 for selected young men (some 300 each year). For this training, the volunteer journeyman agrees to stay in the Air Force for X number of years (at least 3) *beyond* his obligatory service of 3 years. While at IAI, he is paid a salary commensurate with his task. Furthermore, he can return to IAI upon completion of his obligated duty with the Air Force.

This flow of young men, and selected young women, into maintenance profession preparation is a continual operation geared to certain time cycles. Depending on the skill requirement and subsequent training time, these well trained young people are sent to the field or forward bases in conformance with the headquarters manpower allocation program. In all probability, the individual will remain at the same base for the entire tour of duty, 4-6 years. As mentioned earlier, it is the Base Commander who has the responsibility for developing this input into what appears to be a highly skilled team of individuals. At the base, the maintenance profession seems to really develop. The input may arrive as a mechanic trained on J-79 engines or on some particular aircraft — but who at the base, in all likelihood, will be truly cross trained and become very efficient in a number of related areas. This is not to say that specialization has gone by the board. In fact, as the IAF becomes more sophisticated, so does the specialization.

TRAINING

Training is designed to meet functional needs and is continually reassessed. The “field” or forward base has the responsibility for final training to meet its operational needs. Every base has standards, defined by keys (headquarters developed for production aircraft); e.g., the Phantom may need 2-3 specialists for a particular type of maintenance. In other words, the planning and headquarters group* establish standards the personnel people must meet. Not every base gets fair treatment. Men may be sent to do a job which is allied to their training but not the specific position for which they were trained. The Base Commander must make them proficient — and usually does.

It appears that the IAF meets its requirements in what is proudly called the maintenance “profession” by means of three basic classes of inputs; (1) government subsidized technical training, (2) private technical training, and (3) industrial apprentice programs. These are augmented by inputs from volunteers who have completed obligatory duty (3 years) in another service.

The exceptionally well trained IAF maintenance technician will remain at the same or related task for the duration of the tour. This will be either 3 or 6 years. Prior training will be either approximately 18 months or 3 years. Most will not remain in the military beyond the obligatory tour (3 years) plus the additional service time required for training they have received. Encouragement is given the noncommissioned technicians to remain.

The Israeli are training for technical competence and feel that training for career patterns is a luxury they cannot afford. They believe that training for career patterns creates overstocked senior NCO ranks who then perform roles for which they were not trained.

*It is important to recognize that these same people who set the standards are genuine experts in their fields, experienced themselves, who interact regularly with those actually engaged in training and maintenance.

PROMOTION

Skills are more broadly defined than in the U.S. "Horizontal" skills are equivalent skills on different equipment. The base maintenance officer assigns the new man into the job he wants him to do and he remains on the job for his minimum obligation. Progression occurs from the lance corporal status in which he usually arrives at the base. For some stages he has to go to short schools, for others he has to take exams by a rotating Air Force examining team. His advancement in military rank is ultimately dependent on advancement in proficiency rank until a given point — after 3 years. However, proficiency advancement and military rank advancement are not necessarily synonymous.

The basics for "up in ranks" are:

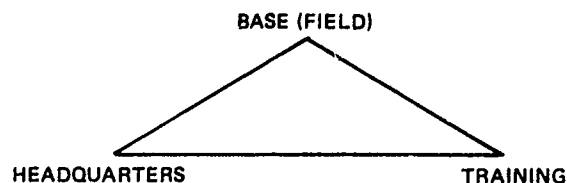
1. Minimum time period
2. Recommendation by Commanding Officer
3. The man signs he has done the job (certification of performance proficiency)
4. Quality Control Supervisor (Master Sgt) must sign off

One Lieutenant Colonel has had some 18 years of experience in aircraft maintenance as a mechanic and an aircraft squadron maintenance officer, and at the Lieutenant Colonel level is a mechanical and/or aeronautical engineer. A maintenance officer is not necessarily an engineer *prior* to acquiring rank but is supported by the IAF and Government in acquiring additional *directly related* expertise and degrees — in exchange for further service.

Most maintenance officers, including the headquarters type, have come up through the ranks, and at one base a maintenance officer (a Colonel) is/was the Commanding Officer. This experiential factor impressed the author as the "cornerstone" of the *modus operandi*.

MAINTENANCE OPERATIONS

The IAF has what might be called triangular control over manpower requirements. Headquarters must establish requirements, review the national manpower pool, and provide the facilities necessary to develop the profession. Training must, at this phase, continually assess its inputs, technological developments, and base requirements and meet the needs in orderly fashion. The base must accept the technicians it receives and make them proficient to assure accomplishment of its mission.



While this triangular concept and interplay allow for broader bases of activity, there are forces pulling in all directions. (Training needs more time, the base may not get "fair" treatment, etc., and everybody screams.)

Basically there are three levels of maintenance. One is Squadron (service crews), the second is Intermediate, and the third is Depot. Each squadron has approximately 60 maintenance type personnel, organized in teams that are, in fact, turnaround crews that refuel, rearm, and do minor maintenance equivalent to that performed at our organizational level. The members of the teams are cross-trained for interchangeability. They appear to have very few electronic checkout units.

The first echelon has the immediate support of the second, the Intermediate level group, which also supports other squadrons and other types of aircraft on a regular basis. The facilities at the Intermediate level maintenance areas appear well equipped and are industrially designed to contain the shops necessary to maintain the aircraft assigned. The required skills are also available. There is a maintenance control for scheduled maintenance that coordinates the operations of the Squadron and Intermediate levels.

Depot level appears to be the responsibility of Israel Aircraft Industries Ltd. (IAI). It is here that the aircraft mechanic apprentice program appears to have contributed significantly to the IAF maintenance profession.

An illustration of the continual hunt for greater responsiveness is an apparent transfer from Depot level to the base of what is normally called mid-span inspection, or the 1100-hour engine tear-down/disassemble. Experimentation has been ongoing with a "mini-inspection" at the forward base, where the service crews disassemble, visually inspect, and replace needed parts. This prolongs the life of the engine and has saved the IAF many thousands of dollars. It has also made the mid-span inspection less costly in time and spares.

Extremely tight controls are exercised over tools, test equipment, etc. Daily inventory checks are mandatory, as are similar checks between shifts of personnel. Tools are costly, and this control not only minimizes losses but also increases the efficiency of the technicians who perform the checks.

A maintenance computer system provides daily readouts that indicate to all cognizant officers the causes of failure, delays, etc., whatever the reason. The system also indicates training deficiencies which have resulted in poor maintenance, errors in diagnosis, and/or inefficient techniques. The training command implements immediate corrective training procedures.

While there are company representatives with the Air Force, they are considered an expensive luxury after the first year. Even during the first year they are closely monitored.

The experiential factor provides the basis of the Israeli problem-solving ability. One non-Israeli technical expert said, "They are innovative and inventive, and solve problems by pioneering. They look at an improvement in terms of how well it extends the life of a plane or an equipment and its impact on manpower resources -- not of dollar cost."

CONCLUSION

ACCOMPLISHMENTS OF THE ISRAELI

The Israeli maintain the IAF at a high degree of system readiness and combat effectiveness -- as high as 90-95% and without cannibalization.

The Israeli maintain efficient training establishments.

The Israeli are eager to effect changes of whatever nature that will improve their programs.

The Israeli pilot will normally leave the IAF at the age of 40-42 after 20-22 years of service. The day he leaves he will be at the peak of his competence, and he will maintain his competence in the reserves.

The IAF uses these reserves effectively as an integral part of the Force.

The Israeli pilot selection process prunes most severely prior to and in the early phases of flight training.

Initial pilot training indicates the direction each flier will take within the Force, be it in jets, helicopters, or transports; as a pilot or a navigator.

Every Israeli pilot serves as an instructor. There is a functional role and slot for every officer. The ratio of staff and headquarters assignments is low.

Maintenance is a profession. Fliers do not occupy maintenance positions. Each maintenance officer knows his plane, engine, avionics, and weapons. Tools are a costly investment and are accounted for. Management of facilities is lean, efficient, and effective. Interface of squadron, intermediate maintenance, depot, and industry is efficient and noncompetitive.

IAF and Israeli research work hand in hand.

In the IAF there is concentration on men rather than machines. Instruction is pointed toward sharpening of the power of decision in the individual. Teaching the man to think clearly, observe keenly, and report accurately is the main object in training. Leadership is the key. "Success comes with leading, not pushing."

SIGNIFICANCE OF THE ISRAELI EXPERIENCE

S.L.A. Marshall (Brigadier General, USA ret., military historian) wrote: "Military systems advance most easily and at lowest cost by watching well what others do somewhat better."

This principle was successfully applied by the Israeli in the course of developing the IAF. Even so the price has not been low, and the fielding of the IAF represents a continuing sacrifice on the part of the state and the people. The burden is accepted. Nothing less will do. The outlook is to the future. Other sacrifices are viewed equally positively:

"They fell for the defense of the nation - let them be praised forever."

The U.S. currently confronts problems with pilot retention and combat effectiveness. To be sure, our situation is different from that of the Israeli. Nevertheless, Marshall's principle may be as useful to us in meeting our particular challenge as it was useful to the Israeli in meeting theirs. We could begin by watching well what the Israeli are doing.

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